I hereby declare that all statements made herein are of my own knowledge to be true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both under § 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize that validity of the application or any patent issued thereon.

DATED this 11 day of October, 2004

Rodney LaFollette

RODNEY M. LAFOLLETTE, PH.D.

602 East 300 South
Salt Lake City, Utah 84102
Telephone: (801) 364-5633

Throughout his career, Dr. Rodney M. LaFollette has worked on high efficiency designs of secondary batteries and fuel cells, especially bipolar designs. Funded research activities over the past ten years include lithium/lithium peroxide solid state batteries, bipolar silver/zinc batteries, several types of bipolar lead acid batteries, including an effort funded by General Motors/Department of Energy to build a bipolar lead acid battery for use in hybrid vehicles. Further funded efforts include microscopic batteries for use in MEMS and other integrated circuits, remote autonomous sensors, fuel cells, and capacitors. Dr. LaFollette also has extensive experience with mathematical modelling of batteries, including the development of a model of spirally-wound lead acid batteries used in the Hybrid Vehicle Program at General Motors. Dr. LaFollette has served as Principal Investigator on research contracts and grants totaling over $4M over the past 13 years.

Employment

1992 – Present President/Founder, Bipolar Technologies Corp., Provo, UT

1990 – 1992 Vice President of Engineering, Enyon Corp., Provo, UT

1987 – 1990 Senior Materials Eng., International Fuel Cells, South Windsor, CT

Education

Academic Diploma, International School of Brussels, Brussels Belgium, 1975

B.S., M.S., Chemical Engineering, Brigham Young University, 1984

Ph.D., Chemical Engineering, Brigham Young University, 1988

Professional/Honor Societies	**Areas of Expertise**
Tau Beta Pi, Sigma Xi,	Mathematical Modeling,
Electrochemical Society,AIChE	Electrochemistry, Colloid Chemistry,

Publications

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Patents

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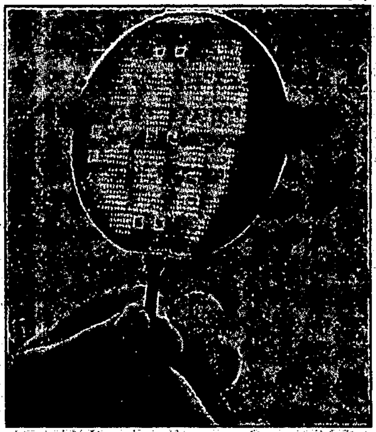

Mark Philbrick/Brigham Young University

Brigham Young professor Linton Salmon is reflected in a wafer that he helped invent. It contains 1,200 batteries.

Honey, I shrunk the battery

BY DAN NAILEN

THE SALT LAKE TRIBUNE

Computer researchers are not only building better gadgets as technology advances, but making them smaller, faster and cheaper.

Microelectromechanical systems, or MEMS, have dominated the work of many researchers and engineers in recent years. MEMS are a series of miniature electronic structures and sensors integrated on one silicon chip. They range in size from less than one inch to a micron — one-thousandth the thickness of a nickel.

MEMS are not only compact, but usually are more precise than older systems due to the close proximity of their parts. They are already used commercially in automobile air bags, with a tiny MEMS sensor triggering the bag when it senses a rapid change in motion. More potential applications pop up every day.

Now a Brigham Young University engineer wants to give MEMS systems their own power source.

Linton Salmon, BYU's associate dean of engineering and technology, supervised MEMS research for the National Science Foundation in the early 1990s. During his NSF tenure, Salmon noticed dozens of grant seekers developing MEMS. He also noticed most of the projects had to be energized by outside power sources, mainly batteries several times the size of the MEMS chip itself.

"For a lot of electrical engineers, power is just something you buy the battery (for)," Salmon said. "They build a sensor, then go looking for batteries to fit."

When he returned to BYU, Salmon decided to create a microbattery capable of fitting inside MEMS. After several trial runs, he and his colleagues have created a design they believe could revamp MEMS.

See BATTERIES, Page C-8

Batteries: The Shrinking Power Source

Continued from C-1

Next week, Salmon will present his group's findings to the Solid-State Sensors and Actuator Workshop, a leading MEMS industry forum meeting in Hilton Head, S.C. The conference has been held every other year since 1984 and is limited to 300 researchers, all actively working with MEMS.

Most MEMS industry scientists are either electrical engineers or mechanical engineers, Salmon said, "but batteries are a chemical thing, and we needed chemical engineers" to build a MEMS battery.

Salmon's microbattery is made of a nickel and zinc compound, and includes a tiny, tightly sealed reservoir of liquid electrolytes to supply the needed power. It is built with the same processes used to make computer chips, he added, including "extremely small dimensions and extremely pure materials."

The entire microbattery is only as thick as a strand of human hair and is the same size as the circuits on the MEMS silicon chips, Salmon said. The design is intended to enable MEMS producers to eventually include the microbattery internally in their products.

"The question," Salmon said, "is how much energy can it put out for how long?"

Salmon sees the microbattery potentially used in conjunction with miniature timers. Since the various sensors on a MEMS chip do not need to be powered up at all times, the timer can send the microbatteries a message to turn on at specific intervals. In turn, the microbatteries would power the sensors to activate and send data, using radio signals, to a remote central computer.

The microbatteries are rechargeable as well, Salmon said, and a MEMS chip could potentially function indefinitely with a small solar cell, timer and one of the new microbatteries.

Some day in the near future, he said, a house thermostat could cost significantly less if it includes a microbattery instead of being wired to a power source and a furnace. A timer-rigged microbattery could power the MEMS sensors measuring the temperature, which would then send the measurements by radio wave to a central computer at assigned intervals.

Once Salmon and other researchers determine how much energy can be stored in a microbattery, the tiny power sources could be used to monitor vital signs in trauma victims or power the pumps regulating insulin flow in diabetics. The batteries could even be used to power sensors that measure automobile tire or engine wear, sending radio messages to the car's onboard computer at scheduled times.

Robert Huber is a professor of electrical engineering at the University of Utah and a member of the organizing committee for the Hilton Head conference. He said Salmon's research was selected for the conference because "it's high quality work, it's a novel idea and has the possibility of having a lot of uses."

Huber, who has been attending the MEMS conferences since 1986, is quick to note that all the ideas presented at Hilton Head are in the early stages of research. The microbattery and other potential products are still speculative, he said."

"How much energy can you really store?" Huber asked of the microbattery. "That remains to be seen."

Salmon and the BYU research team plan to commercialize their microbattery through Bipolar Technologies, an Orem-based battery manufacturer.